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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/706,298	11/03/2000	Frederic Gaillard	AMAT/4564/ISM/LOW K/JW	6722

32588 7590 11/21/2002

APPLIED MATERIALS, INC.
2881 SCOTT BLVD. M/S 2061
SANTA CLARA, CA 95050

EXAMINER

PEREZ RAMOS, VANESSA

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 11/21/2002

4

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/706,298

Applicant(s)

GAILLARD ET AL.

Examiner

Vanessa Perez-Ramos

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-60 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-60 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bjorkman et al. (U.S. 6,340,435) in view of Yau et al. (U.S. 6,054,379).

In regard to claims 1-2, 6, 12-15, 20-26, 29-30, 33-35, 39-42, 47-50 and 53, Bjorkman discloses a semiconductor manufacturing method comprising: depositing first, second and third dielectric layers (col. 7, lines 58-65); etching the dielectric layers to form horizontal and vertical interconnects (col. 8, lines 37-38 and 48-50); depositing one or more conductive materials to fill at least a portion (col. 9, lines 25-27); and, planarizing the surface by CMP (col. 7, lines 25-27). Furthermore, Bjorkman discloses that the conductive materials are deposited by CVD, PVD, electroplating or combinations thereof (col. 7, lines 22-25), and that the materials could be aluminum, copper, tungsten, among others (col. 7, lines 18-20).

Bjorkman is silent about removing a portion of the dielectric material and then depositing a low k dielectric material and a self planarizing dielectric layer.

Yau et al. discloses a semiconductor manufacturing process and teaches the deposition of a low k dielectric layer followed by the deposition of a self planarizing dielectric layer. Yau discloses that these layers can be used as liners, cap layers, etch stop layers, adhesive layers adjacent to other dielectric layers, deposited over metal layers, (col. 2, lines 43-67), among other

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uses, and they provide excellent barrier properties, provide strength to other layers, serve as diffusion barriers, and further provides for a reliable dual damascene structure (col. 3, lines 1-4).

It is the Examiner's position that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Bjorkman by removing a portion of the remaining dielectric in order to deposit a new, low-k dielectric layer and a self planarizing dielectric layer, as per Yau, because the deposition of these new layers would result in a more reliable dual damascene structure, would provide strength to the underneath layers and would act as diffusion barriers, all of which are highly desirable during semiconductor manufacturing.

In regard to claims 3, 7, 16-18, 44 and 51-52, Bjorkman discloses that the first and third dielectric layers contain silicon and oxygen, which reads on Applicant's "silicon oxide" layer (col. 5, lines 47-48), and that the layer has a constant of 3.0 or less (col. 10, line 63).

In regard to claims 4, 8 and 45-46, Bjorkman discloses that the second dielectric acts as an etch stop layer (col. 7, lines 63-64).

In regard to claims 5, 9-11, 19, 28, 36-38 and 54, Bjorkman discloses the use of silicon carbide (col. 9, lines 56-67, and col. 10, lines 56-67).

In regard to claims 27 and 43, the repetition of the steps that lead to the formation of a dual damascene structure is well known in the art, depending on how many levels are desired.

In regard to claims 31-32, Yau discloses the use of a compound containing silicon and carbon (col. 2, lines 52-53), and discloses that this is a low-k dielectric layer, which reads on Applicant's "dielectric constant of about 4.0 or less".

In regard to claims 55-60, Bjorkman discloses the use of trimethylsilane (col. 10, see Table, 3rd entry). Bjorkman further discloses the addition of oxidizing and inert gases (col. 10, lines 56-65). Bjorkman is silent about the preferred flow rates, pressure and temperatures.

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However, it is the Examiner's position that the variation of process parameters such as pressure, temperature and flow rate would have been obvious to one of ordinary skill in the art, if only to determine the optimum process conditions.

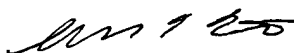
3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vanessa Perez-Ramos whose telephone number is 703-306-5510. The examiner can normally be reached on Mon-Thurs 7:00am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703-308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-5665.

Vanessa Perez-Ramos
Examiner
Art Unit 1765

VPR
November 17, 2002


BENJAMIN L. UTECH
SUPERVISORY PATENT EXAMINER
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